Level 3 Certificate and Extended Certificate in Applied Science

KEY CONCEPTS IN SCIENCE

Unit number: ASC1

Section C – ASC1/P (Physics)

Tuesday 23 January 2018    Morning

Time allowed: 1 hour 30 minutes

For this paper you must have:
- a calculator
- formulae sheet.

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.
INSTRUCTIONS

• Use black ink or black ball-point pen.

• Answer ALL questions in each section.

• You must answer the questions in the spaces provided. Do not write on blank pages.

• Do all rough work in this book. Cross through any work you do not want to be marked.

• The total time for all three sections of this paper is one-and-a-half hours.
INFORMATION

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60 and the maximum mark for this section is 20.
- You will be provided with a copy of the formulae sheet.
- There are three sections in this paper:
  Section A – Biology
  Section B – Chemistry
  Section C – Physics.

ADVICE

- You are advised to spend approximately 30 minutes on this section.
- Please read each question carefully before starting.

DO NOT TURN OVER UNTIL TOLD TO DO SO
Power stations which use renewable energy resources produce around 25% of the United Kingdom’s electricity.

TABLE 1 shows different types of power station.

Tick (√) ALL of the power stations in TABLE 1 which use renewable energy sources. [1 mark]

<table>
<thead>
<tr>
<th>TYPE OF POWER STATION</th>
<th>Tick (√)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass</td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td></td>
</tr>
<tr>
<td>Geothermal</td>
<td></td>
</tr>
<tr>
<td>Natural gas</td>
<td></td>
</tr>
<tr>
<td>Nuclear</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td></td>
</tr>
<tr>
<td>Wave</td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td></td>
</tr>
</tbody>
</table>

[Turn over]
Hydroelectric power is another type of renewable energy.

FIGURE 1 shows a hydroelectric power station.

The hydroelectric power station has a power output of 440 MW when water passes through it.

Water is supplied from a reservoir.
167 000 kg of water flow through the power station each second.

Calculate the loss of gravitational potential energy per second of the water as it flows from the reservoir to the power station.

Give an appropriate unit for your answer. [3 marks]

Assume \( g = 9.8 \text{ ms}^{-2} \)

Loss of gravitational potential energy

per second = __________ Unit = __________
01.3 Calculate the efficiency of the hydroelectric power station. [2 marks]

Efficiency = ___________________

01.4 State TWO ways in which energy could be wasted in the hydroelectric power station. [2 marks]

1 _________________________________

_____________________________________

_____________________________________

2 _________________________________

_____________________________________

_____________________________________

[Turn over]
Nuclear power stations produce approximately 20% of the United Kingdom’s electricity.

Describe how electricity is generated in a nuclear power station. [4 marks]
State ONE disadvantage to the environment of using a nuclear power station to generate electricity. [1 mark]

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

[Turn over]
A technician has set up four electrical circuits. She uses three identical 10 Ω resistors in each circuit.

FIGURE 2 shows the arrangement of resistors in each circuit.

FIGURE 2
State which circuit, A, B, C or D, has the LOWEST total resistance and which has the HIGHEST total resistance. [2 marks]

Lowest total resistance

____________________________________

Highest total resistance

____________________________________

[Turn over]
The technician uses two of the identical 10 Ω resistors in a circuit as shown in FIGURE 3.

FIGURE 3

Add a component to FIGURE 3 which would allow the technician to measure the voltage across ONE of the resistors. [1 mark]

Calculate the reading on the ammeter in FIGURE 3. [2 marks]

Reading on ammeter = ________________ A
02.4 State what the expected voltage across each resistor should be. [1 mark]

Voltage = ________________ V

02.5 The technician measures the voltage across one of the resistors. The voltage is less than she expects it to be.

Give ONE reason why the voltage is lower than expected. [1 mark]

_____________________________________

_____________________________________

_____________________________________

END OF QUESTIONS
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